WHAT IS CLAIMED IS:

1. A method of controlling Ambient Electromagnetic Radiation Environments to improve the performance of gas phase chemical lasers comprising the steps of:

applying POETRY Theory to the energy transfer processes in order to determine the specific dependencies of each of these processes upon the ambient electromagnetic radiation environment (AERE) and kinetic temperatures;

using POETRY Theory to determine the spectral frequency bands that need to be controlled for each of these kinetic processes;

performing the necessary analytical calculations to estimate the effects of moderating the AERE at these frequencies;

monitoring these frequencies in subscale and scaled flow experiments to quantify the POETRY Theory predictions and analytical calculations;

applying anti-reflective coatings, designed to reduce the reflectivity of the undesired spectral ranges to the surfaces surrounding the gas flow for the purpose of mitigating the AERE in these frequencies ranges;

providing radiation sources and reflective coatings to surfaces surrounding the reaction chamber to promote those kinetic processes that are beneficial to the laser performance; and

monitoring the appropriate spectral frequencies in the AERE.

2. The method as set forth in claim 1, wherein the step of performing includes scaling calculations to determine threshold conditions and optimum flow configurations and conditions to control the radiation at these frequencies.

3. The method as set forth in claim 2, wherein the radiation is controlled by adjusting the shapes, contours and temperatures of the nozzle and surrounding hardware.

4. The method as set forth in claim 1, wherein the step of applying coatings includes using dichroic optical isolators to isolate the flow component modules that are combined to construct a larger laser.

5. The method as set forth in claim 1, further comprising the step of reducing unobstructed free volume to improve performance.

6. The method as set forth in claim 5, wherein the step of reducing unobstructed free volume includes at least one of baffling, tortuous paths and contouring of the surfaces to increase radiation loss.

7. The method as set forth in claim 1, further comprising the steps of constructing containment walls for a Singlet Oxygen Generator (SOG) of a material with a high emissivity (low reflectivity) in the 4 – 12 micron spectral region and cooling said walls to minimize the radiation in the spectral region.

8. The method as set forth in claim 7, further comprising the step of improving the performance of a large volume supersonic COIL laser by using optical isolators to reduce and minimize the 4 – 12 micron radiation that is generated within the laser cavity.

9. The method as set forth in claim 1, further comprising the steps of controlling the ambient electromagnetic environment (AERE) to minimize the H + HF deactivation reactions by using anti-reflecting coatings in the 2-4 micron region of the infrared spectra on the nozzle face and containment walls of the supersonic flow, cooling of these walls and operating the supersonic flow at or below 300 K to improve performance of supersonic HF/DF chemical lasers.

10. The method as set forth in claim 9, wherein the step of operating the supersonic flow at or below 300 K is performed by operating a fluorine combustor at reduced plenum temperatures (T ~ 1200K), and using a large expansion area nozzle to achieve hypersonic velocities and very low expansion temperatures (T~ 100 K) of the primary flow.

11. The method as set forth in claim 10, wherein hydrogen or deuterium is pre-cooled to liquid nitrogen temperatures and injected parallel to the main flow so as to minimize flow stagnation effects.

12. The method as set forth in claim 1, further comprising the step of using optical coatings to mitigate the AERE in the 5.2 micron region of the infrared spectrum to improve the performance of a supersonic azide based chemical laser based upon the NCl(a) + I - NCl(X) + I* process.

13. The method as set forth in claim 1, further comprising the step of using optical coatings and radiation sources to enhance the AERE in the 5.2 micron region of the infrared spectrum to improve the performance of a supersonic visible red chemical laser based upon the NCl(b-X) transition.

14. The method as set forth in claim 1, using the family of electronic transition lasers based upon the stimulated emission process, $NF(a) + X + h\nu \rightarrow NF(x) + X^* + 2h\nu$ where X = HF, DX, CO, NO and other diatomic molecules with large dipole transition radiative cross-sections.